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*Original Article*

# Relationship between Oxidative Stress, Serum Zinc Level and Systemic Arterial Blood Pressure in Smokers and Non-smokers

**Zarchi Theint Theint Hlaing*, Myat Su Bo, Mya Mya Thwin**

**ABSTRACT**

**Background and Aim:** Either active or passive smoking causes damage to the heart and blood vessels. The aim of this study is to investigate the relationship between oxidative stress, serum zinc level and systemic arterial blood pressure in smokers and non-smokers. **Methods:** A cross sectional comparative study was done. Apparently healthy subjects of age 18-45 years including 40 smokers and 40 non-smokers residing in Magway Township, Myanmar were recruited. Serum zinc level was measured by atomic absorption spectrophotometry method. Serum malondialdehyde level was used as oxidative stress marker and measured by spectrophotometry. Systemic arterial blood pressure was measured by indirect method using mercury sphygmomanometer. **Results:** Mean serum zinc level of smokers (51.25±7.5 µg/dL) was significantly lower than that of non-smokers (92.91±27.46 µg/dL) ($P$< 0.001). Mean serum malondialdehyde level of smokers (0.78±0.14 µmol/L) was significantly higher than that of non-smokers (0.24±0.09 µmol/L) ($P$< 0.001). Mean Systolic Blood Pressure (SBP) of non-smokers was 120.95±5.02 mmHg and that of smokers was 126.55±6.14 mmHg ($P$<0.05). There was significant negative correlation between serum malondialdehyde level and serum zinc level ($r$ = - 0.75, $P$< 0.001, $n$=80). There was also significant negative correlation between serum zinc level and SBP ($r$ = - 0.477, $p$< 0.001, $n$=80). There was positive correlation between serum malondialdehyde level and SBP (r = 0.487, $p$< 0.001, $n$=80). **Conclusion:** It could be concluded that smoking increases oxidative stress and decreases serum zinc level and these two changes might contribute to increase in blood pressure in smokers.

**Key words:** Serum zinc level, Serum malondialdehyde level, Smoking, Systolic blood pressure, Oxidative stress.

**Zarchi Theint Theint Hlaing*, Myat Su Bo, Mya Mya Thwin**

*Department of Physiology, University of Medicine-Magway, Natmauk Road, Magway, Township, Magway Regional Division, MYANMAR.*

**Correspondence**

**Dr. Zarchi Theint Theint Hlaing**
*Department of Physiology, University of Medicine-Magway, Natmauk Road, Magway, Township, Magway Regional Division, MYANMAR.*
Phone: +95943009631
Email: zarchi.tth@gmail.com

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## INTRODUCTION

Smoking is one of the lifestyle factors that distress the health of human and have been killing millions of human beings for many centuries.[1] It is one of the major risk factors for the development of atherosclerosis, coronary heart disease, acute myocardial infarction and sudden cardiac death.[2]

Cigarette smoke contains over 4700 different chemicals. Many of these are oxidants and pro-oxidants that can produce free radicals and enhance the oxidative stress.[3] Malondialdehyde (MDA) is generated from Reactive Oxygen Species (ROS) and one of the most frequently used indicators of oxidative stress markers.[4] Oxygen free radicals can directly initiate the process of lipid peroxidation that contributes to cardiovascular diseases.[5]

Cigarette smoke contains reactive peroxyl radicals and acetaldehyde which can increase lipid peroxidation. It can also be connected with the production of free radicals by polymorphonuclear leucocytes. Free oxygen radicals also caused tissues and microvascular damage.[6] Oxidative stress promotes vascular smooth muscle cell proliferation and hypertrophy and collagen deposition leading to thickening of vascular media and narrowing of vascular lumen.[7]

Zinc is a vital element in maintaining normal structure and function of cells and which acts as components of antioxidant enzymes. Zinc is actively involved in protecting the body against oxidative stress.[8] In addition, 30 percent of cellular zinc is found within the nucleus of mammalian cells and playing a role in regulation of gene expression. Zinc-dependent metabolic functions are present in every tissue. Severe zinc deficiency can damage on cardiovascular system, gastrointestinal, central nervous system, immune system, skeletal and reproductive system.[9] In smokers, alterations in the activity of the antioxidant enzyme defense system may lead to smoking-induced oxidant stresses.[8] Changes of zinc concentration in smokers may give rise to some of the long-term negative effects on the body.[10]

A combination of raised blood pressure and smoking may have a synergistic impact on cardiovascular functions.[11]

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